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(54) Multi-colored industrial signal device

(57) An industrial signaling device having a single module with the capability of emitting different colored lights to indicate the operating condition of a machine. The emitted hight can be steady or flashing, and controlled by an external PLC or an onboard microprocessor. The PLC or microprocessor interprets incoming information and causes the color of the light or its flashing pattern to change accordingly. The light source maybe an LED, ionizable gas or flourescent.

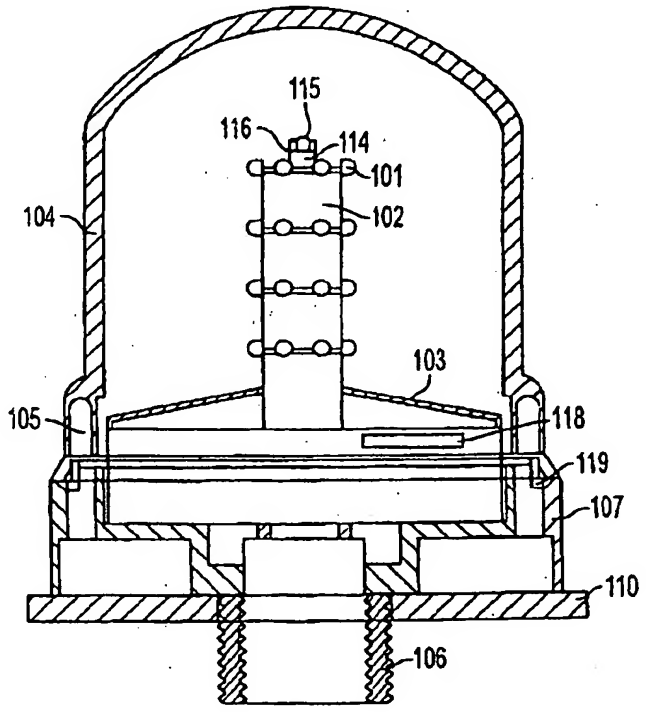

FIG. 1

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source. In another embodiment, the emission of the light is controlled by an external programmable logic controller and the module optionally contains a microprocessor. Light sources contemplated for use in this invention include LEDs, ionizable gas or a flourescent light. The present invention may include a reflective material mounted to reflect light out of the module. In another embodiment lens cover of the module is made from a polycarbonate material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 is an vertical cross-section view according to one embodiment of the present invention;
Figure 2 is a horizontal cross-section view;
Figure 3 is an explanatory diagram of a vertical cross-section that illustrates light projection;
Figure 4 is an explanatory diagram of a horizontal cross-section view illustrates light projection;
Figure 5 is an exploded vertical cross-section view;
Figure 6 is an exploded vertical cross-section view including a vertical cross-section view of a post with LEDs;
Figure 7 is a horizontal cross-section view of an LED cluster;
Figure 8 is a vertical view of a striated lens cover; and
Figure 9 is a vertical view of an embodiment of the present invention mounted upon a surface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Referring to the drawings, Figure 1 illustrates the horizontal cross-section view of one embodiment of a single module of an industrial signaling device 100 of the present invention. A cover 104 surrounds and encloses rings of LEDs 101 mounted on a cylindrical wafer with a hollow center 102, which may be made of plastic. The lower three rings of LEDs are sandwiched between the cylindrical wafer, which are hollow in the center so they may be mounted on a post 114. A nut 115 and washer 116 secure the LEDs and cylindrical wafers into place.

[0014] The cover may be made of any substance that allows that transmission of light and is suitably tough enough for an industrial manufacturing environment, such as a plastic, for example, polycarbonate. To facilitate the diffusion of light, the plastic may be admixed with a fibrous substance or sand blasted to give a foggy appearance. Also, the cover may be clear or striated by grooves on any surface. The cover may be domed shaped or may have a flat top. The base 107 may be attached to the cover by an attachment means, such as screws, (not shown) that connect to the attachment-means holes 105 located at the bottom of the cover 104. The base may have a threaded stem 106 for installation on a stalk or directly on to a machine. An optional gasket 110 may be secured with a locking nut 112. Optionally, below the gasket, a metal plate (not shown) may be mounted.

[0015] An o-ring 119 may be mounted between the interface of the cover and the base to keep out dust, moisture, and other harmful agents present in the external environment. An advantage of the present invention is that only one interface is present between the cover and the base. By having a single module there is a single interface between the cover and the base. An interference of a module is a weak point that is more susceptible to penetration from harmful outside agents such as moisture, dust, corrosive chemicals, etc. The more interfaces that exist on a device, the more likely the device will fail because of attack from harmful outside agents.

[0016] The bottom reflector 103 may be conically shaped as shown or could be another shape, such as flat. The base may be coated with a reflective material to enhance the diffusion of the LEDs. The base may be conically or cone shaped to increase the amount of light transmitting outside of the cover 104. The base has an opening not shown from which the post 102 is inserted through. Wiring (not shown) connects the LEDs to an electrical power source and to a PLC (not shown) or an on board processor 118. Clusters of LEDs 101 are placed on the pole and separated by a distance sufficient to optimize placement of the LEDs with the focal point of the cover. The clusters of LEDs may be ring shaped. Each cluster of LEDs allows light to emit 360 degrees from a particular elevation. Such placement of the LEDs allows both vertical as well as horizontal (bi-planar) separation of the point LED light sources. This bi-planar separation allows greater diffusion of the light sources and a resulting enhanced fill of the lens enclosure. Diffusing the light enables increased viewing distance from the signal source. In this embodiment, four cluster of LEDs are shown but more or fewer rings may be used. Also for this embodiment, each cluster of LEDs has seven individual LEDs, although clusters having more or less LEDs are also envisioned. The number of LEDs in each cluster may be increased or decreased as desired. The clusters are preferably LEDs of different colors. In one embodiment each cluster has three red, two blue or green, and two amber LEDs.

[0017] The wafers are generally of the same shape as of the post. These wafers separate the LED rings and provide structural stability. The entire assembly is held together by a non-conductive plastic or nylon nut 115 that threads onto a threaded plastic bolt that runs up through the hollow central post assembly. Similar color LEDs on each cluster are electrically connected in series. Electrical connections are made within the hollow interior of the LED/wafer stacks and run down the stack to a printed circuit board (not shown) in the base of the signal light.

[0018] The printed circuit board is electrically con-

18. An industrial signaling means according to claim 14, wherein said light source means emits lights of three different colors.

19. The industrial signaling means of claim 14, further comprising a reflective means mounted beneath said light source.

20. The industrial signaling means of claim 14, further comprising a reflective means mounted above said light source.

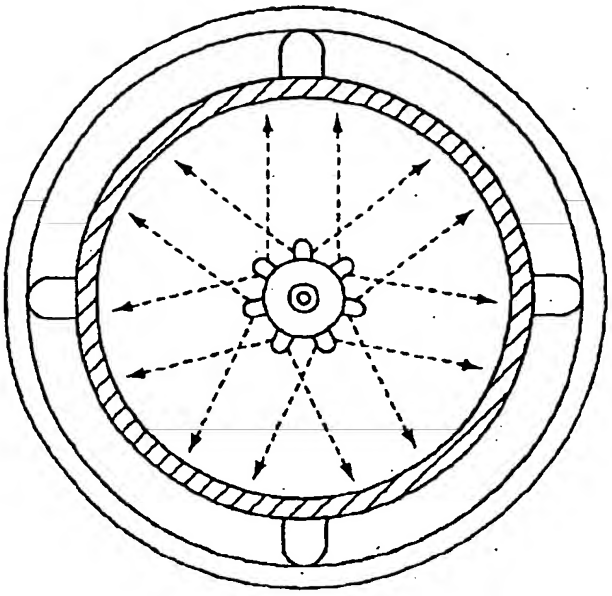

FIG. 4

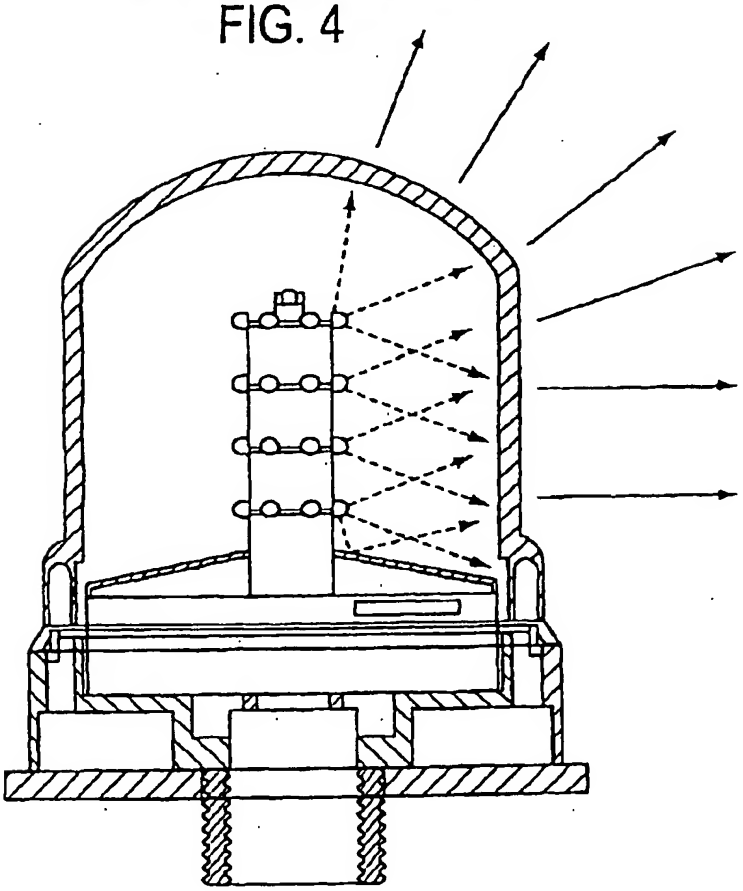

FIG. 3

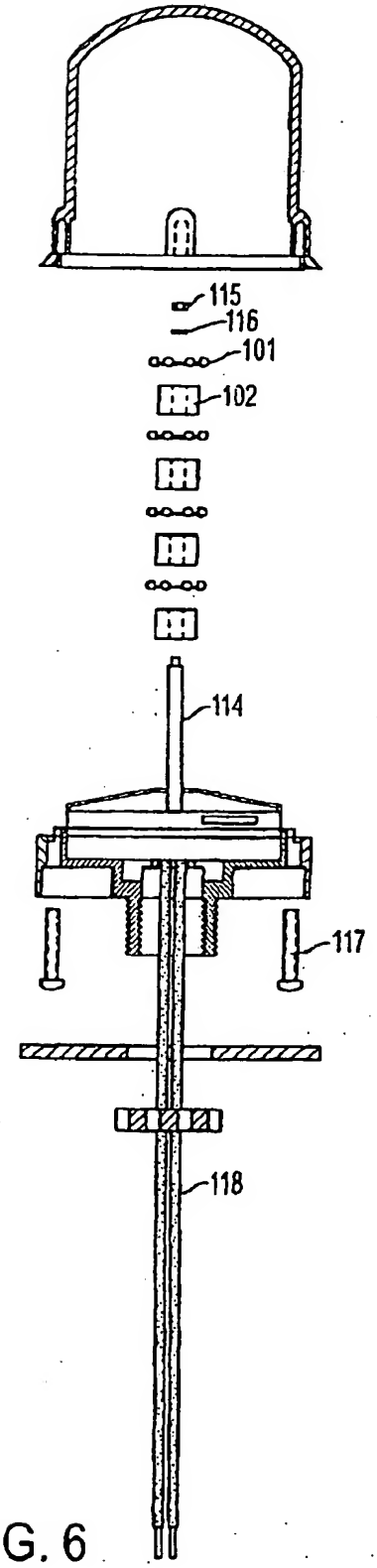

FIG. 6

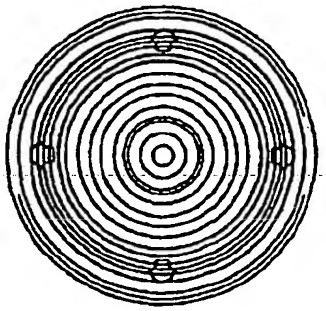

FIG. 8

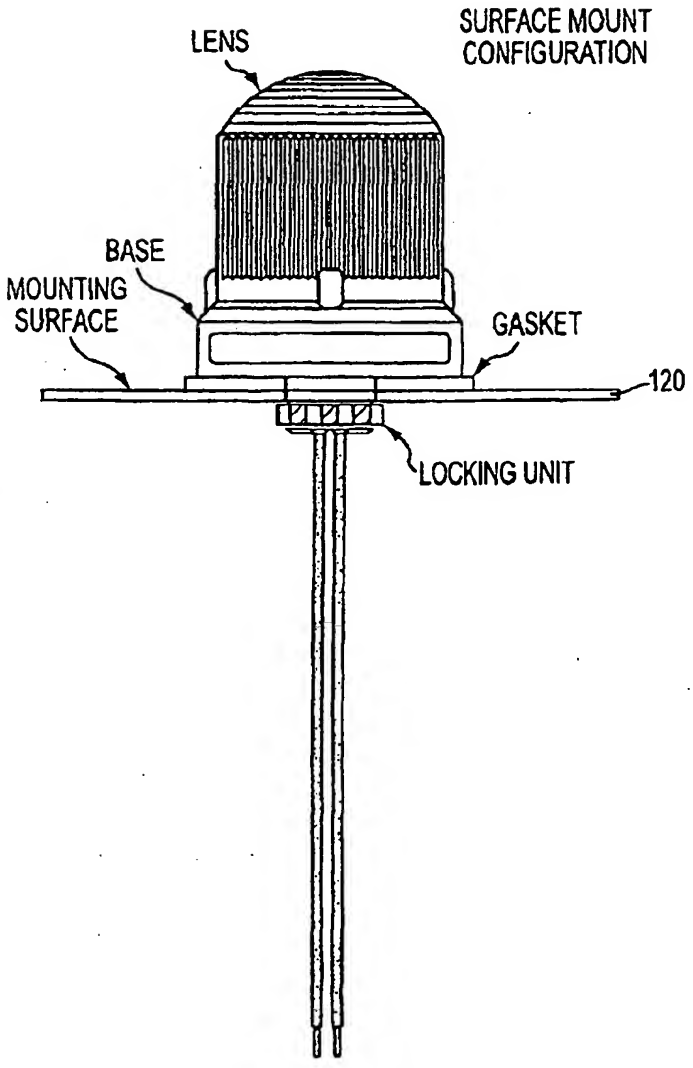

FIG. 9